REMARKS

Claims 1-17 are currently pending in the subject application, and are presently under consideration. Claims 1-17 are rejected. Favorable reconsideration of the application is requested in view of the comments herein.

I. Rejection of Claims 1-5 and 12-13 Under 35 U.S.C. §102(e)

Claims 1-5 and 12-13 stand rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Publication No. 2002/0135866 to Sasaoka, et al. ("Sasaoka"). Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claim 1 recites a multimode optical fiber comprising a core having a longitudinal optical axis and incorporating radially dependent amounts of dopant materials to provide a desired refractive index profile and a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes. In the Office Action dated September 19, 2006 (hereinafter "Office Action"), the Examiner asserts that Sasaoka discloses a multimode optical fiber based on a teaching that the fiber optic cable of Sasaoka is configured to amplify a plurality of wavelength components (Office Action, page 2; citing Sasaoka, paragraph 11). Representative for Applicant respectfully disagrees with this assertion.

Sasaoka teaches a Raman amplification optical fiber that inputs a plurality of wavelength components and outputs amplified signal light (Sasaoka, paragraph 11). However, Representative for Applicant respectfully submits that Sasaoka does not teach that the Raman amplification optical fiber is a multimode fiber. That the optical fiber of Sasaoka inputs a plurality of wavelength components is irrelevant to whether the optical fiber is single mode or multimode. In the art of optical fibers, mode relates to modes of oscillation of light within the optical fiber, such that beams of light scatter within the fiber at the interface between the core and the cladding at angles that correspond to the modes. Higher order modes have greater angles of scattering. See, *e.g.*, Present Application, paragraphs 3 and 15.

The Examiner's assertion that wavelength components correspond to optical modes not only mischaracterizes the language of claim 1, but is also internally inconsistent with the

language of claim 1. Specifically, claim 1 also recites a desired refractive index profile and a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes. Such an interpretation of optical modes as wavelength components is therefore inaccurate, in light of the additional language of claim 1. Accordingly, Representative for Applicant respectfully submits that in neither the cited section nor anywhere else does Sasaoka teach a multimode fiber.

The Examiner also asserts that Sasaoka teaches incorporating radially dependent amounts of dopant materials to provide a desired refractive index profile and a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes (Office Action, page 3; citing Sasaoka, paragraph 22). Representative for Applicant respectfully disagrees. Sasaoka teaches that a core of the optical fiber is doped with GeO_2 to attain a refractive index higher than that of silica (Sasaoka, paragraph 22). However, Sasaoka is silent as to incorporating radially dependent amounts of dopant materials, as recited in claim 1. Instead, Sasaoka merely discloses GeO_2 doping of the core without any teaching as to non-uniformity of the amount of dopant material in the core of the optical fiber. In addition, Sasaoka does not teach that the GeO_2 dopant of the optical fiber core provides a desired Raman gain coefficient profile. Sasaoka is silent as to the effect of the GeO_2 dopant on a Raman gain coefficient profile, but instead teaches that a desired Raman gain coefficient is obtained based on chromatic dispersion of each wavelength of the light and fiber effective area (see, *e.g.*, Sasaoka, paragraph 26). Therefore, Sasaoka does not teach incorporating radially dependent amounts of dopant materials to provide a desired refractive index profile and a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes, as recited in claim 1.

The Examiner further asserts that the optical fiber of Sasaoka "would inherently allow higher Raman gain along the optical axis and promote lower order modes and discriminate against higher order modes as the prior art fiber would have identical properties to the applicant's fiber;" (Office Action, paragraph 3). However, Representative for Applicant respectfully disagrees with this assertion based on the lacking of Sasaoka to teach a multimode fiber that

incorporates radially dependent amounts of dopant materials to provide a desired refractive index profile and a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes, as recited in claim 1. Accordingly, Sasaoka does not anticipate claim 1 because Sasaoka fails to teach each and every element of claim 1. Withdrawal of the rejection of claim 1, as well as claims 2-5, 12, and 13 which depend therefrom, is respectfully requested.

Claim 2 depends from claim 1, and thus should be allowed over the cited art for the same reasons as described above regarding claim 1. In addition, claim 2 recites incorporating radially dependent amounts of a dopant that affects the Raman gain coefficient, to provide a radially dependent Raman gain coefficient profile, and that the Raman gain coefficient has its highest value along the optical axis of the fiber. As described above regarding claim 1, Sasaoka does not teach incorporating radially dependent amounts of a dopant that affects the Raman gain coefficient, as recited in claim 2. The Examiner asserts that the Raman gain coefficient has its highest value along the optical axis of the fiber (Office Action, page 3; citing Sasaoka, FIG. 1B). Representative for Applicant respectfully disagrees. Sasaoka teaches a refractive index profile of the core and the first and second cladding of the optical fiber (Sasaoka, FIG. 1B; paragraph 23). However, FIG. 1B of Sasaoka is directed solely to a refractive index, and not to a Raman gain coefficient. Sasaoka is silent as to a radially dependent Raman gain coefficient profile having its highest value along the optical axis of the fiber. In addition, Sasaoka teaches that, for a given chromatic dispersion and fiber effective area, the optical fiber has a static value for Raman gain coefficient, and thus not a radially dependent value of the Raman gain coefficient (see, *e.g.*, Sasaoka, paragraphs 8, 26, and 41). Accordingly, Sasaoka does not teach incorporating radially dependent amounts of a dopant that affects the Raman gain coefficient, to provide a radially dependent Raman gain coefficient profile, and that the Raman gain coefficient has its highest value along the optical axis of the fiber, as recited in claim 2. Withdrawal of the rejection of claim 2, as well as claims 3-5 which depend therefrom, is respectfully requested.

Claim 4 depends from claim 2, and thus should be allowed over the cited art for the same reasons as described above regarding claim 2. In addition, as described above regarding claim 2,

Sasaoka does not teach a radially dependent Raman gain coefficient profile having its highest value along the optical axis of the fiber. Therefore, Sasaoka does not teach that the Raman gain coefficient profile has a generally parabolic shape with a peak coinciding with the optical axis of the fiber, as recited in claim 4. Withdrawal of the rejection of claim 4 is respectfully requested.

Claim 12 depends from claim 1, and thus should be allowed over the cited art for the same reasons as described above regarding claim 1. In addition, as described above regarding claim 1, Sasaoka teaches GeO_2 doping of the optical fiber core without any teaching as to non-uniformity of the amount of dopant material in the core of the optical fiber. Therefore, Sasaoka does not teach that the radially dependent amounts of dopant materials comprise a minimum amount of dopant material near an interface between the core and the cladding region with a gradual transition to a maximum amount at the optical axis, as recited in claim 12. Withdrawal of the rejection of claim 12 is respectfully requested.

Claim 13 depends from claim 1, and thus should be allowed over the cited art for the same reasons as described above regarding claim 1. In addition, claim 13 recites that the fiber is configured to provide higher Raman gain along the optical axis for multimode light launched into the fiber. Sasaoka teaches that Raman amplification light is provided to the optical fiber (see, *e.g.*, Sasaoka, paragraph 29). However, Sasaoka does not teach that the light that is pumped into the optical fiber is multimode light. In addition, as described above regarding claim 2, Sasaoka does not teach a radially dependent Raman gain coefficient profile having its highest value along the optical axis of the fiber. Therefore, Sasaoka does not teach that the fiber is configured to provide higher Raman gain along the optical axis for multimode light launched into the fiber, as recited in claim 13. Withdrawal of the rejection of claim 13 is respectfully requested.

For the reasons described above, claims 1-5 and 12-13 should be patentable over the cited art. Accordingly, withdrawal of this rejection is respectfully requested.

II. Rejection of Claims 6-9, 11, and 14-17 Under 35 U.S.C. §103(a)

Claims 6-9, 11, and 14-17 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Sasaoka in view of WO 02/50964 A2 to Clarkson ("Clarkson"). Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claim 6 recites a multimode optical fiber that favors lower order modes, the fiber comprising a core having a longitudinal optical axis and incorporating radially dependent amounts of dopant materials to provide a desired refractive index profile and a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes. Claim 6 also recites that light launched into the fiber is subject to higher Raman gain along the optical axis, which promotes lower order modes and discriminates against higher order modes. As described above regarding claim 1, Sasaoka does not teach a multimode fiber, and further does not teach incorporating radially dependent amounts of dopant materials to provide a desired refractive index profile and a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes.

The addition of Clarkson does not cure the deficiencies of Sasaoka to teach or suggest claim 6. Clarkson teaches a fiber-based optical source with a high power laser diode stack pump source shaped into an intense beam by focusing and light concentrating elements (Clarkson, Abstract). However, the combination of Sasaoka and Clarkson does not teach or suggest a multimode fiber comprising a core having radially dependent amounts of dopant materials to provide a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes, as recited in claim 6. Therefore, neither Sasaoka nor Clarkson, individually or in combination, teach or suggest claim 6. Withdrawal of the rejection of claim 6, as well as claims 7-10 which depend therefrom, is respectfully requested.

Claim 7 depends from claim 6, and thus should be allowed over the cited art for the same reasons as described above regarding claim 6. In addition, as described above regarding claim 2, Sasaoka does not teach a radially dependent Raman gain coefficient profile having its highest value along the optical axis of the fiber. Therefore, Sasaoka does not teach that the Raman gain coefficient profile has a generally parabolic shape with a peak coinciding with the optical axis of

the fiber, as recited in claim 7. The addition of Clarkson does not cure the deficiencies of Sasaoka to teach or suggest claim 7. Accordingly, neither Sasaoka nor Clarkson teach or suggest claim 7. Withdrawal of the rejection of claim 7 is respectfully requested.

Claim 11 recites a method of generating a diffraction limited high brightness laser beam in a multimode fiber comprising providing a core with radially dependent amounts of at least one dopant that provides a Raman gain index profile with maxima coinciding with an optical axis of the fiber, and in the fiber, favoring the lowest order mode by providing maximum Raman gain along the optical axis, and discriminating against higher order modes. For substantially the same reasons as described above for claims 6 and 7, claim 11 should be allowed over the cited art. Withdrawal of the rejection of claim 11, as well as claims 16 and 17 which depend therefrom, is respectfully requested.

Claim 14 depends from claim 6, and thus should be allowed over the cited art for the same reasons as described above regarding claim 6. In addition, as described above regarding claim 1, Sasaoka teaches GeO_2 doping of the optical fiber core without any teaching as to non-uniformity of the amount of dopant material in the core of the optical fiber. Therefore, Sasaoka does not teach that the radially dependent amounts of dopant materials comprise a minimum amount of dopant material near an interface between the core and the cladding region with a gradual transition to a maximum amount at the optical axis, as recited in claim 14. The addition of Clarkson does not cure the deficiencies of Sasaoka to teach or suggest claim 14. Accordingly, neither Sasaoka nor Clarkson teach or suggest claim 14. Withdrawal of the rejection of claim 14 is respectfully requested.

Claim 15 depends from claim 6, and thus should be allowed over the cited art for the same reasons as described above regarding claim 6. In addition, as described above regarding claims 2 and 13, Sasaoka does not teach a radially dependent Raman gain coefficient profile having its highest value along the optical axis of the fiber and that the light that is pumped into the optical fiber is multimode light. Therefore, Sasaoka does not teach that the fiber is configured to provide higher Raman gain along the optical axis for multimode light launched into the fiber, as recited in claim 15. The addition of Clarkson does not cure the deficiencies of

Sasaoka to teach or suggest claim 15. Accordingly, neither Sasaoka nor Clarkson teach or suggest claim 15. Withdrawal of the rejection of claim 15 is respectfully requested.

Claim 16 depends from claim 11, and thus should be allowed over the cited art for the same reasons as described above regarding claim 11. In addition, as described above regarding claims 1 and 13, Sasaoka does not teach a multimode optical fiber and that the light that is pumped into the optical fiber is multimode light. Therefore, Sasaoka does not teach that launching the pump power into one end of the multimode fiber comprises launching a multimode laser input into one end of the multimode fiber, as recited in claim 16. The addition of Clarkson does not cure the deficiencies of Sasaoka to teach or suggest claim 16. Accordingly, neither Sasaoka nor Clarkson teach or suggest claim 16. Withdrawal of the rejection of claim 16 is respectfully requested.

Claim 17 depends from claim 11, and thus should be allowed over the cited art for the same reasons as described above regarding claim 11. In addition, for substantially the same reasons as described above regarding claim 14, claim 17 should be patentable over the cited art. Withdrawal of the rejection of claim 17 is respectfully requested.

For the reasons described above, claims 6-9, 11, and 14-17 should be patentable over the cited art. Accordingly, withdrawal of this rejection is respectfully requested.

III. Rejection of Claim 10 Under 35 U.S.C. §103(a)

Claim 10 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Sasaoka and Clarkson and further in view of U.S. Publication No. 2003/0161361 to Paldus, et al. ("Paldus"). Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claim 10 depends from claim 6, and should be allowable for at least the reasons described above regarding claim 6. The addition of Paldus does not cure the deficiencies of Rice, Siegman, and Clarkson to teach claim 6. Paldus teaches a laser tuning mechanism that embodies spectrally dependent spatial filtering (Paldus, Abstract). However, the combination of Sasaoka, Clarkson, and Paldus, individually or in combination, does not teach or suggest a

multimode fiber comprising a core having radially dependent amounts of dopant materials to provide a desired Raman gain coefficient profile that favors lower order modes and discriminates against higher order modes, as recited in claim 6, from which claim 10 depends. Accordingly, claim 10 should be patentable over the cited art. Withdrawal of the rejection of claim 10 is respectfully requested.

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CONCLUSION

In view of the foregoing remarks, Applicant respectfully submits that the present application is in condition for allowance. Applicant respectfully requests reconsideration of this application and that the application be passed to issue.

Please charge any deficiency or credit any overpayment in the fees for this amendment to our Deposit Account No. 20-0090.

Respectfully submitted,

Date 12-11-06

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